W+HF background in Run I and Run II

- Want to estimate W+HF ($Wb\bar{b}(c\bar{c})$ and Wc) in $t\bar{t}$ sample

- $Wb\bar{b}$ means gluon splitting ($g \to b\bar{b}$)

- W+HF cross section has large uncertainty (μ, $m_{b,c}$, PDF)
  but MC's $F_{HF} = \frac{Wbb}{W+Njets}$ reduces this dependency

- $N_{Wbb} = N_W F_{HF} \epsilon_{tag}$

- F_{HF} from MC and cross checked in generic jets

W+HF background in Run I

- Herwig(PS), good for low inv mass $\rightarrow$ 1 bjet (F_1)

  VECBOS+Herwig, good for high inv mass $\rightarrow$ 2 bjets (F_2)

- Large uncertainty in gluon splitting rate $\Rightarrow$ calibrate in generic jets

- Herwig's HF in QCD events (DP, FE, GS) <u>match</u> Jet_50,100(20) tag rate

  To calibrate:

  - Select subsamples (j) with enriched/depleted GS

    (eg: 2 tags (DP), 1 tag + 1 jet at $\Delta R < 0.4$ (GS))

  - Fit distributions ($\chi^2 = \sum_j \frac{[D_j - S_j]^2}{ED_j^2 + ES_j^2}$, $S_j = \sum_n a_n C_{(n,j)} SF^\alpha$)

  - $SF(g \rightarrow bb) = 1.4 \pm 0.2$

  - SF only applied to Herwig

- $N_{Wbb}^{njet} = N_{realW}^{njet}(F_1^{njet}\epsilon_1^{njet} + F_2^{njet}\epsilon_2^{njet})$
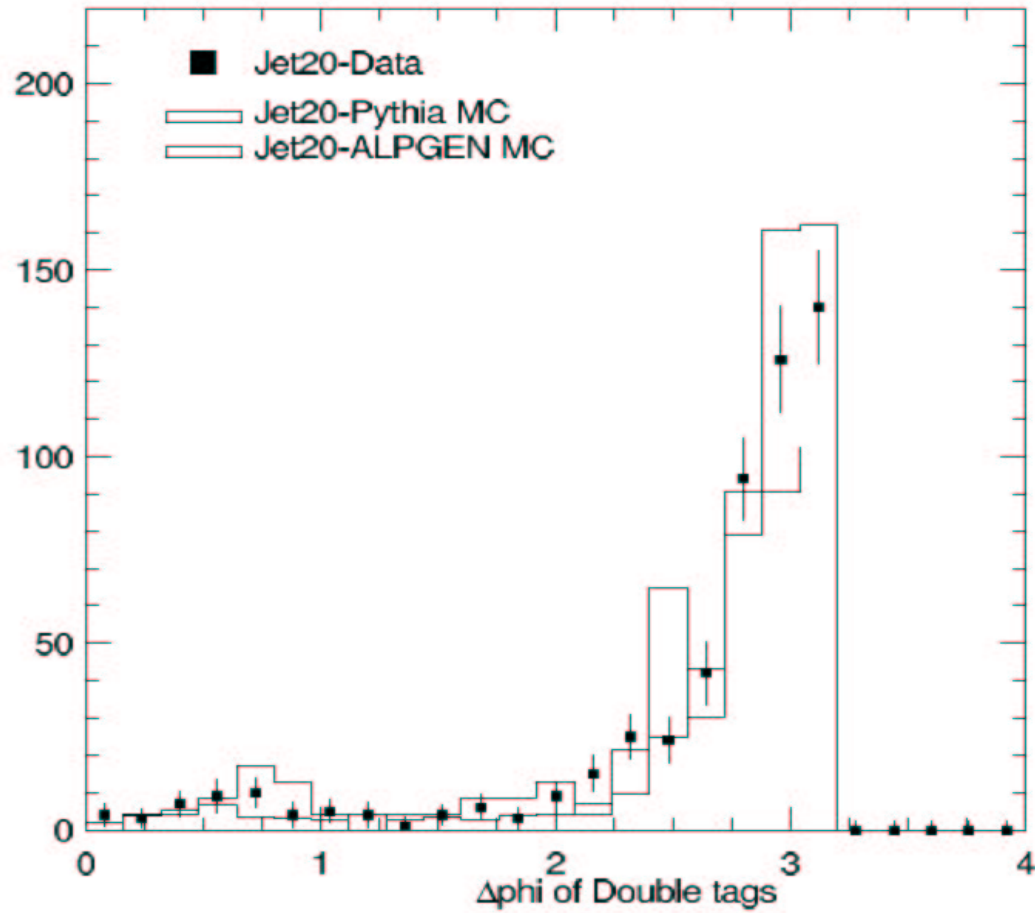
W+HF background in Run II

- Use Alpgen+Herwig

  - Alpgen takes into account HF masses

  - Need to avoid double counting - W+n(ME)+PS and W+n+1(ME)
    Match partons with PS jets (and/or calorimeter jets?)

  - Results will depend on matching criteria

- Calibration:

  - Calibrate with generic jets, using pseudo-$c\tau$ fits to tagged jets

  - Use Jet_20 (less GS than higher samples)

  - Pythia and Alpgen+Herwig compared to data: Alpgen+Herwig:
    $K = 1.5 \pm 0.4$ (Pythia does better ~ 1.3)

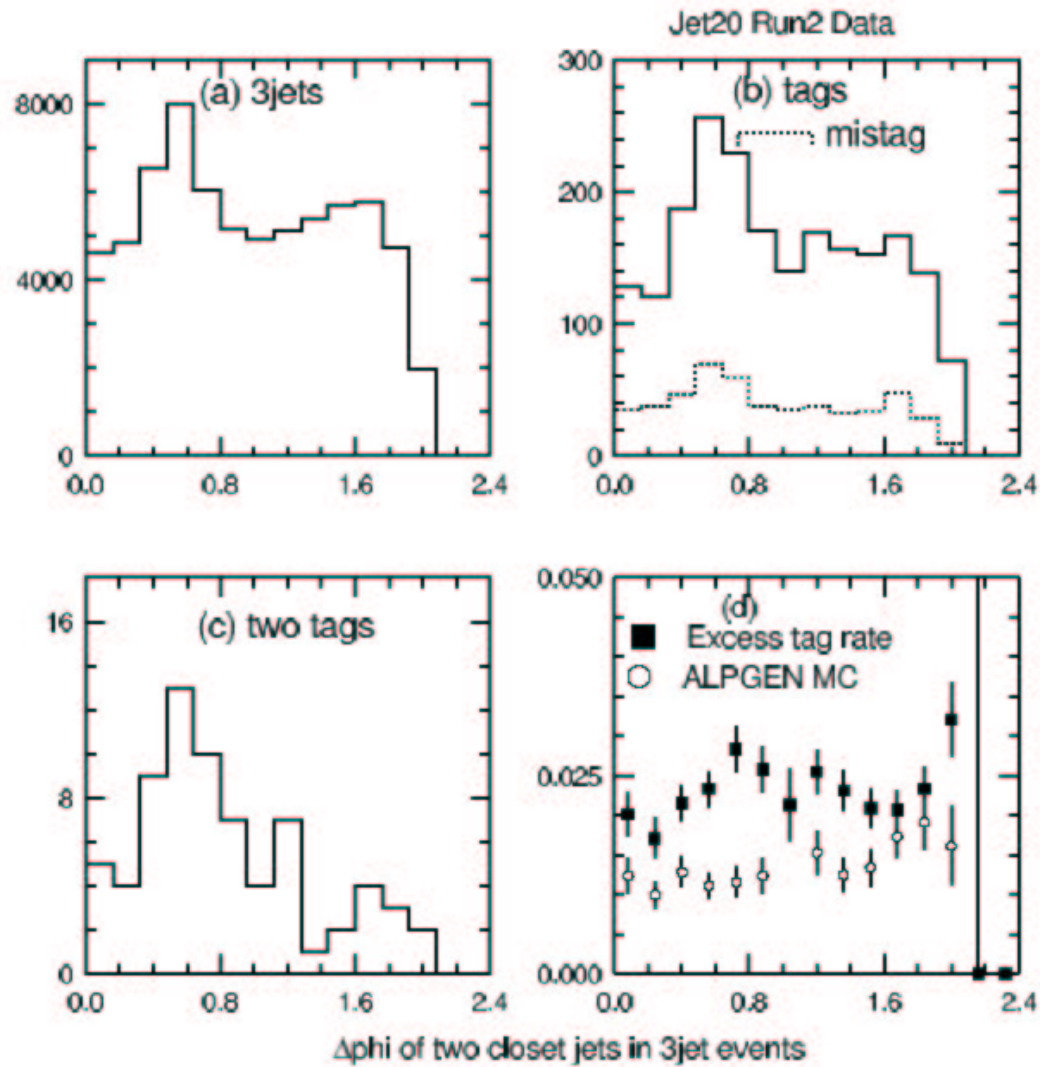- $N_{Wbb}^{njet} = N_{realW}^{njet} F^{njet} \epsilon^{njet} \Phi_E$

Comments

- K factor and Run I SF($g \to bb$) not the same

- Run I claim that pseudo-cτ gives unreliable results

- Jet_20 does has little GS

- DP should always be modeled correctly

- Not nearly enough plots in CDF7007 (Fig 17 cut!)

$\Rightarrow$ Not clear than anything "wrong", plan to redo and see.

CDF7007: $\Delta\phi$ of tagged jets in MC (Pythia and Alpgen) and data (Jet_20)

CDF7007: $\Delta\phi$ of 2 closest jets in 3 jets Alpgen events, last compared tag rates

Jet20 Run2 Data

(a) 3jets

(b) tags
mistag

(c) two tags

(d)
■ Excess tag rate
○ ALPGEN MC

Δphi of two closet jets in 3jet events

cτ templates from btopga (dijet, $E_T > 90\text{GeV}$) - Daniel's cutecode